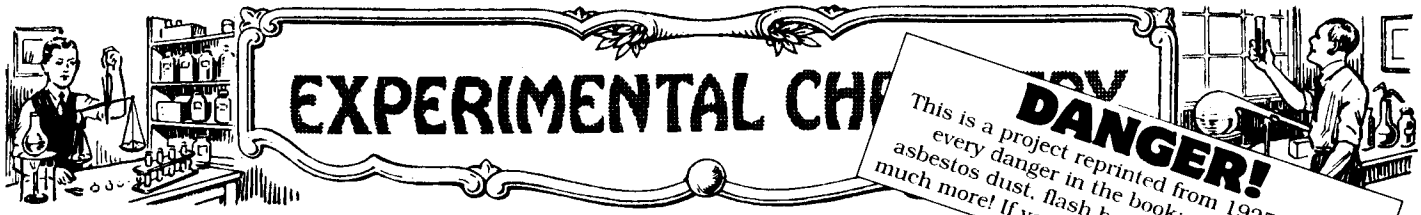
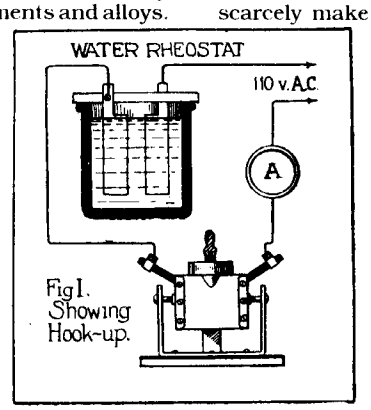

EXPERIMENTAL CH
DANGER!
This is a project reprinted from 1925. It offers every danger in the book: electrocution, asbestos dust, flash burns, asphyxiation, and much more! If you try it, do so at your own risk!

Electric Arc Crucible

By Philippe A. Judd

History shows us that on all parts of the globe – no matter how far separated by space or time – the advance of civilization has been coincident with man's discovery and use of the metallic elements and alloys.

Any laboratory supplied with the usual 110-volt A.C. lighting circuit possesses the facilities for obtaining one of the highest temperatures yet produced by man, that of the electric arc, 3500° C. (6332 F.), at which carbon vaporizes. This is the temperature of the relatively small space between the electrodes; otherwise one would experience no little difficulty in its regulation. As it is, the arc may be inclosed, together with the substance to be melted by some non-conducting material, which will conserve the greater portion of the heat engendered, and thus cause the fusion of the material to be melted.



Connections of the electric arc furnace, showing a water rheostat, ammeter, and the furnace proper on its journals.

The electric furnace described includes an electric arc provided with a suitable housing which also forms a crucible for the molten metals. It was designed for experimental purposes, the dimensions given making it suitable for use in the laboratory and for the casting of small pieces. Its construction permits the contents of the crucible to be poured directly into the mould without the use of the customary tongs or ladle, and, avoiding wasteful transfers.

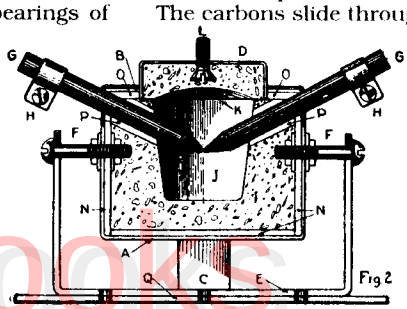
The arc is wired in series with a rheostat capable of passing 8 or 9 amperes for several hours without undue heating, a water rheostat probably being the best for this purpose. One may readily be prepared by immersing two copper plates in a two-gallon earthenware jar of salt water. After striking an arc, salt should be added until the ammeter reads about 7 amperes (see Fig. 1).

In Fig. 3 is given a pattern for the case, which is cut out of rather heavy sheet steel (about 20 gauge), and is then bent up and bolted or riveted as shown in Fig. 2. A tin can of suitable dimensions might be substituted for this, although it would scarcely make so serviceable a case. The interior is lined with asbestos board, one-eighth inch thick.

The two 8/32 stove bolts (F) are firmly clamped to the sides with nuts and washers and serve as pivots on which the crucible swings in the bearings of the yoke (E). The leg (C) is bolted to the back of the case, together with the handle (M) to steady the crucible and prevent it from swinging.

The yoke (E) is a 12-1/2-inch, length of 1/16-inch x 1-inch strap iron, drilled, slotted and bent as shown. It is mounted near the edge of the asbestos-covered base to facilitate pouring.

The arc electrodes (G) are regular 3/8 inch arc light carbons, about 6 inches in length and are provided with copper terminal clips (H).



Sectional view of the furnace, showing clearly all parts. The chamber may be formed with a small flower pot as the matrix to be withdrawn when the lining has dried out.

When the case has been assembled and lined, it is ready for the refractory filling. This consists of powdered fire clay and asbestos wool, mixed to a stiff putty-like consistency with water. The clay should predominate, the asbestos serving both as a non-conductor and a binder. The lute thus formed is packed around the inside of the case and well tamped. A small flower pot, such as are used in greenhouses for seedlings, serves very well to form the crucible cavity (J) and should be smeared with vaseline to prevent the clay sticking to it. The carbons slide through asbestos board bushings (P) which are formed by rolling a single thickness of the sheet about the carbons. When the filler has reached the height the electrodes are to occupy, the wrapped carbons are laid in place and the packing is completed.

The cover (D) is a tin can lid, 2-1/2 inches in diameter, filled with the lute. It has a cavity (K) scooped out of its underside to form a reflector. It has a stove bolt (L) embedded in it to serve as a handle which may be provided with a knob. The lute should be allowed to thoroughly dry before the steel (B) and asbestos (O) tops are put in place. This will require several days, at least. With the top pieces clamped securely in place by the flanges and the whole mounted on a suitable base or bench top, the furnace is ready for use.

A small vent, formed between the arris of the cover and the channel (I), will permit the escape of any gases formed. Care should be taken to place the furnace under a ventilating hood, or in the open, when arsenic, mercury or phosphorus is to be added to the contents of the crucible, as their vapors are very poisonous.

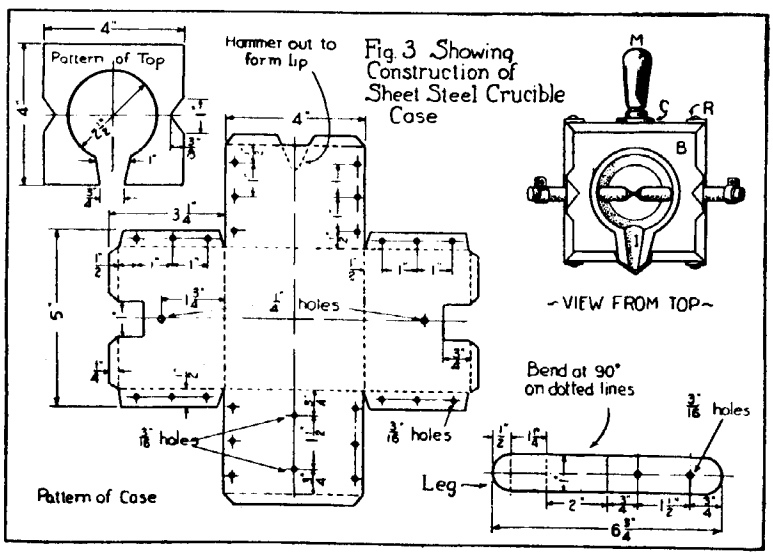


Diagram with dimensions of the various parts of the furnace-jacket and the view of the furnace showing the spout or lip through which the fusion is poured.

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